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ABSTRACT

Whereas 10 years ago the concerns of students were for improvement and achievement in the knowledge of science and for success in college, today they are concerned about the interactions between man and his environment. Teachers must be trained to cope with these new directions. A program for the education of science teachers is proposed which would combine formal training with increased interaction between faculty and students. Students selected would have had a variety of experiences, including a degree of personal failure to increase their understanding of their pupils' insecurities. The first 2 years would be a personal and exploration period, beginning with a battery of psychological and cognitive tests. During the first year the student would take three college courses, work in a tutorial program, and work in three blue collar jobs. The second year would include either three or six additional college courses, three white collar jobs, and work with children of various ages. At the end of this year a decision would be made on the student's future career. The third and fourth years would include science and methods courses and work in a team as teaching assistants. In the fifth year, the student-faculty team would be responsible for the total program for a group of high school students. Every 5 years the team would return to the campus for further studies. (MBM)

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THE REAL WORLD AND PEOPLE TEACHER EDUCATION PROGRAM

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THE REAL WORLD AND PEOPLE TEACHER EDUCATION PROGRAM

Gene E. Hall

Introduction

The present, almost revolutionary evolution of our society requires a concomitant revolutionary evolution in the function of education and the roles of teachers and students. A rethinking of education is necessary if education is to retain, or perhaps regain, a leadership role in our society. In thinking about the function of education and the preparation of science teachers, many kinds of inputs must be considered.

For this reason the first section (I. FACTORS RELATED TO SCIENCE TEACHER PREPARATION) has been broken into the following parts:

1. A look at science curricula
2. From the student's point of view
3. The teacher
4. What about schools as institutions?
5. Summary

Following these considerations, the second section (II. A REAL WORLD AND PEOPLE TEACHER PREPARATION PROGRAM) will propose what one program for preparing teachers of science would look like. This program has many gaps, however. In the next hour we should be able to fill most of these in, especially since we will not be constrained by having to consider the "realities" of implementation.

However, the realities of implementation of even a small educational innovation sometimes can require unreasonably large amounts of effort. The final section of this paper (III. SOME PROBLEMS FOR THIS OR ANY OTHER PROGRAM) is a description of some possible problems inherent in implementation of this or other programs.

I. FACTORS RELATED TO SCIENCE TEACHER PREPARATION

A look at science curricula

For traditional science educators, the 1960's will probably be considered "the decade of highest glory for science education,"

especially in terms of curriculum development. Some of the secondary school science curriculum developers had an early start in the late 1950's, however, even the early starters managed to spread their work over the total ten-year span of the 1960's. Although large scale funding of science curriculum projects has ended, many science educators feel that the job is not finished. Curriculum developers never seem to finish developing.

Unfortunately, when student enrollment in high school science courses is studied, there is much data to support the argument made by curriculum developers that the job is not done. "Revolutionary" curricula have been developed in physics, chemistry, biology, earth science, astronomy, oceanography, marine biology, engineering and others. At the same time, due to the encouragement of Conant, scientists, admirals, the Cold War Russians and the great space race, the importance of high school courses in science for every citizen as well as future scientists is unquestioned. The importance of science teaching and science learning has resulted in the mandate that every high school student take at least one science course. This has become state law as well as one of the rumored requirements for entrance to college.

Although millions of dollars have been spent on curriculum development and a sizeable amount of money has been spent on

preparation of teachers to teach the recently developed science curricula, enrollment in high school science courses has continued to drop. This is especially true in physics and chemistry, while the percentage of students taking biology has remained fairly constant. Apparently biology is the lesser evil.

Several possible hypotheses could be proposed in an attempt to explain why, with all the money, talent and effort that has been put into renovating science curricula for the high schools, the number of students taking science continues to decrease. One hypothesis would be that, as the curriculum developers say, their job is not done. Another would be that science teachers have not been trained adequately to teach the new science curricula. This might hold even though there have been academic year institutes, summer institutes, leadership conferences, and so forth to help teachers improve their teaching. Perhaps science is not as relevant to the high school student as the scientists would have us believe, or perhaps students do not see or accept that their responsibility and role in society necessarily implicates the requirement for training in science?

From the student's point of view

In order to make a tentative test of the just mentioned hypotheses data was collected for subjective analysis by interviewing students. Once you ask a student what he would want in

a science course, you will not have to say anything for three or more hours. From their experiences, students have developed plenty of opinions, ideas, observations and inferences about what should and should not go on in a science course. Apparently their experiences have been such that they have very strong feelings about this particular topic. Ten years ago students wanted more basic knowledge, more up-to-date knowledge and more laboratory experiences in order to become better scientists. They were being told that the "sky was the limit" for careers in the sciences. Today's students want to see how science relates to themselves, their environment, society and the future of mankind. Students want a science course to be both pragmatic and value oriented. They want to see emphasis on drugs, ecology, respect for the environment, responsibility of people and institutions and something of "relevance" as well as some ideas on how to do something about these problems.

Students want to consider material in addition to the hard, basic, right-wrong data of the body of knowledge of science. They are not interested in the intellectual skills or processes of science by themselves as another body of knowledge to be acquired. They are not interested in only applying the process skills to solve science problems. Instead they want to study the essence of science from the view of the scientist and the citizen, since both have responsibilities in the application of

science. As one student pointed out, "science has created a hell of a lot of problems." Students feel that science learning should be related to other phases of life and have an interdisciplinary flavor to it, since science does interact with and is inter-related with other things in life.

Students feel that science courses should consider the failures of science and scientists. Not all experiments work out and although you may come up with an answer, the application of the answer may be unsatisfactory, or very unhealthy for society or mankind. One student asked, "Why didn't scientists tell us that it is a closed environment. Why did we have to go to the moon to find out?" This statement could be interpreted as a judgment against the scientist for the plight of our environment. Most scientists certainly have been quiet on the subject until recently. Students themselves, in their every-day lives, not in their science courses, are discovering science truly is inter-related with other aspects of mankind. They then begin to wonder why science in the classroom is not so inter-related.

One student reports "When I took a science course, I felt completely divorced from my life. It was like going into another world when I went into the laboratory to cut up a frog." This student went on to point out that the cutting up of a frog somehow should have been related to other animals, the human being and perhaps to medicine.

At this point it might be interesting to point out what the professional science educator would point out, and that is that all of the recently developed science curricula were designed with the philosophy of doing just what these students are saying is not being done. Some of the new science curricula do emphasize students doing dissections with application to the human body and to the world around them. After all, don't the biology books mention ecology and environment and the physics books refer to rocket engines rather than propeller-driven airplanes? With all of the multi-media approaches and related excursions, of course, the content is relevant to every-day life. However, the students who are supposed to be seeing all this relevance are reporting that they <u>don't</u> see any.

Students go on to say that the emphasis on development of the intellect is not what they need so much as the freedom to create. Students are under tremendous pressure to succeed. Students feel that teachers look at them as if they are dummies. The students' image of themselves is bound to decline - when they do not dare ask a question for fear that the teacher will point out that the answer was in last night's reading assignment or the first laboratory experiment last fall. At the same time, some little, simple question for which the student feels he cannot get an answer may inhibit his further learning or interest in science.

Goodman has pointed out that kids learn to talk outside the school, learn to read in school and that less than 50 per cent of the students, upon leaving school, can read. He asks us to think of what the outcome would be if in school the students were expected to learn how to talk! Kids would not make the grade. Perhaps adults spend so much time talking because they can't read?

The Teacher

After a prolonged discussion about what should go on in science courses -- about the information to be disseminated, about the kinds of teacher-student interactions desired and about how so much is learned outside of the structured classroom compared to what is learned in the classroom -- students get around to talking about characteristics of teachers they would like to have teach them. Their feeling, again, is that teachers should be concerned with relationships to the external environment, not just the body of knowledge within their own classroom. Teachers should have some responsibility to the community, not just drive in, teach the class and leave. Teachers need to take time to consider the kinds of students they are working with.

Kids are different today than when their teachers were in school as students. Kids today are not particularly impressed or awed by the idea that men have walked on the moon. This kind

of feat is accomplished every year. When December 31 rolls around, take a look at the summary of man's technological achievements over the past year and think about whether the kids of today would be very impressed when a man walks on the moon.

Teachers must be aware that the student's value system is different from theirs. Students are more interested in stopping war than they are in luxuriating in the technological advantages brought about by a war-based, research economy.

Students want teachers who will share with them in planning, presenting and evaluating the program. One student reported "You learn better what you <u>want</u> to learn, and if educators do not feel that the students are responsible enough to decide what they should learn that they had better chose a different student body."

Personal interactions are very important to all healthy people. High school students want teachers who are aware, honest and open. Only at rare times in the life of a person will he have the opportunity to interact honestly, openly and eyeball-to-eyeball with a fellow human being. Normally people treat each other in a very superficial manner as in the Simon and Garfunkle song "Sounds of Silence",

> "Hello darkness my old friend,
> I've come to talk with you again"
> and later "People talking without speaking,
> hearing without listening,
> writing songs voices never share,
> no one dare disturb the sounds of silence."

Janis Joplin was crying the message of the young when she said, live all she can, as full as you can, and die young, because where is the joy in sitting around watching your television set into your 60's. Students perceive their teachers and parents to be silent TV watchers. I am not sure that they perceive their fellow students as being much more open. Teachers must be aware of this value system in their students.

Teachers are reported to be middle class in their value orientation and perhaps too comfortable in their living. Teachers of today cannot look at students as if they have the same goals and the same worries in life that the teachers had when they were in high school. Teachers must continually be aware of and recognize the values and concerns of their students. The students of today have kinds of problems and instabilities in terms of the future of themselves and mankind that might be totally incomprehensible for people whose awareness became petrified even ten years ago. They ask what is there to look forward to as you grow older, what respect is there for what you can produce? They can point to a finite probability that the world will blow up any instant, and with every second that passes the probability continues its shift from being an unlikely event to being a very real horror. If one of the various cataclysms does not get you, the war in Southeast Asia or the next place where the so-called brush fires wars evolve may. Then

there are all the personal-individual ways to go, such as heart disease, stroke, arthritis, a drunk driver around the corner, or cancer. Things start to close in.

For the parents and teachers of the students of today, their striving goal in life was acquisition of a house with two cars in the garage. The ultimate in material wealth for them now is to buy a "garbage compactor." Not that there is anything wrong with a garbage compactor, in and of itself. We certainly have a great deal of garbage that needs compacting. But again teachers, in order to be effective, need to be aware of the fact that students may not prize a garbage compactor, at least not as a symbol of status.

What will the students of tomorrow be like? They already have the kinds of material wealth that their parents worked their whole life to get. They do not value what they get easily, just as their parents did not value the gains made by their fathers who worked 72-hour weeks in the sweat shops. "They were dumb to do that." For the kids of today are concerned about man, society, and people, will their children also be concerned about these things? Will these goals be satisfied for mankind by then or will worrying about these kinds of issues have become old-fashioned? It's for sure we will not be traveling to the moon to get away from it all or to other planets to hide. We are going to have to ride it out right here on this planet and

so are they. The teachers trained in the 1970's will be asked to work with students who have, again, different values.

What about schools as institutions?

The problem of institutions is a much larger one. Charles Silberman in a recent series of articles in the Atlantic Monthly and in a recently published book entitled Crises in the Classroom documents the problems and woes of our present system of elementary and secondary schools. There is no need to restate all of the ideas and observations Silberman sets forth, however, he and many others are suggesting that perhaps the present public schools have outlived their usefulness. There seems to be a mounting pessimism that real change can be brought about in the existing schools and that perhaps we should start looking elsewhere for the education of our young. Several kinds of plans that show promise are being tested such as the Parkway Program in Philadelphia and the John Adams High School in Portland, Oregon. Performance contracting is being experimented with a rapidly increasing rate. Representatives from the U. S. Office of Education, school superintendents and even college professors are beginning to talk about public school systems having to face up to what is being called "accountability." That is, the consumer is no longer going to be happy to pay for a product which has very little quality control, such a large consumer rate and has as little updating of factory design as the schools and programs our students travel through today.

Colleges of education are not doing much better. In my travels around the country I am finding one of three kinds of things happening in colleges of education. My prediction for the 70's is that many colleges of education are going to die. Some colleges of education are going to become outstanding by making creative, exciting contributions to education. Other colleges of education are going to continue to bumble along with their heads in the sands just as they have been doing. Examples of all three types of institutions can be identified today. Johns Hopkins University is reported to have done away with their College of Education. The University of Houston, The University of Colorado and Kansas State Teachers College, to name three, are renovating their teacher education programs and releasing faculty time to do this. In addition to their own ideas, the faculties of these institutions are consulting with innovative teacher education projects around the country such as Syracuse University and the Texas R&D Center. They are looking for ideas and products which are new, creative and effective. There are other institutions where the future of the college of education is in doubt. One such institution has had a new school open up right next door to the college of education with the name: the New School for Behavioral Studies in Education. I understand the phones there are answered with "the New School."

A further dilemma which will affect the plight of the colleges of education in the 1970's is that towards the end of

the decade there will be a decline in college enrollment as the post-war baby boom babies graduate. We have already emphasized quantity to the point that there is a surplus of teachers. All of a sudden there are going to be empty classrooms, empty dorms, less dollar support due to less students and many of the middle-aged science educators may be looking for jobs in other kinds of professions. I think there will be fewer demands for the so-called content specialists, and there certainly will be no need for the number of kinds of university personnel that exist today.

Summary

Ten years ago the concerns of students were for dramatic improvement and achievement in terms of the body of knowledge of science and getting ahead in college "Got to have that college education." "If you can get a Ph.D. in one of the sciences, job opportunities are infinite."

The students of 1970 are concerned about interactions with man and his environment. "Will there be a tomorrow?" "What is my role in society?" "What is the function of society?" It certainly isn't to produce mass material goods and to have a forever-increasing gross national product as the basis for a culture. The students of the 1970's want teachers who are personalized and aware. Some questions to ask when preparing teachers of high school students of tomorrow are: What will

students of tomorrow be concerned about? How do we go about preparing a teacher today who will be prepared to cope not only with the students of today (which will not do us any good because the students of today will not be like the students of tomorrow) but also with the students of three or four years from now when the teacher graduates, as well as ten years from now when that teacher is nearing middle age as we are. As a matter of fact, how good a job are you doing of keeping in touch with what students are thinking and concerned about today? Do you know what grok means?

Enough said about perceptions of students, faculty and institutions. Let's look at one possible program. This teacher education program is an attempt to combine some of the complaints and frustrations cited above and perhaps provide some answers for the students of "the decade of concern for man."

II. A REAL WORLD AND PEOPLE TEACHER PREPARATION PROGRAM

This proposed teacher education program would be different in several ways from anything that now exists, however, many things that are included today in the preparation of teachers would be included. In the formal training and interactions with the students in the program, there would be strong emphasis upon students developing personal skills, that is, to be personalized or human in their interactions with others. This

would be done through formal training as well as interactions with faculty and fellow students during the course of the program. The college faculty would also have to be personalized.

The Texas R&D Center has done extensive research in the development of personalized ideas and materials to be employed in the preparation of teachers. I would not propose here that the R&D Center programs necessarily be utilized as they are, however, the personalized component certainly is a necessary one.

Entry Behavior.

In deciding on the kinds of people to enter this program, emphasis will be on picking persons who have had a variety of experiences in their background and hopefully the "right" psychological self-concept profile. Perhaps surprisingly, a degree of personal failure and at times self-doubt might be acceptable for entering students, the reasoning being that since teachers have to be aware of other people who may not feel as secure and confident as teachers are supposed to. They may be better able to do it if they had had some of the same feelings. In terms of intellectual ability, it is obvious that the teachers should be able to master most of the content that they will be expected to teach. This is necessary in order for the teacher to judge alternate routes that a particular student would need, as well as making sure that correct conceptual understanding is relayed to the learner.

One problem in selecting teachers based upon psychological profiles and ability to master content is that using criterion measures of this type may be in violation of their Civil Rights. There is a court case presently being heard questioning whether something as narrow as an I.Q. test can be used as a basis for grouping within schools. In terms of prerequisites, it is not proposed that the student need necessarily to have graduated from high school.

REAL WORLD AND PEOPLE PROGRAM

First Year	Entry tests, feedback and conferences 3 college courses 3 "blue collar" jobs Tutorial teaching
Second Year	3-6 additional college courses 3 "white collar" worker jobs 1/3 of time in working with children at each of three age groups
Decision Time	Conferences and thinking
	I want to become a science teacher
Third Year	Science course work Methods type work and practice Study of learning Work as instructor assistant Unrelated courses and activities Teaching of speciality with many students for several weeks
Fourth Year	Further science and methods course work Become a member of a student-faculty team Student-faculty team works with inservice faculty team and university personnel gradually increasing responsibilities Unrelated courses and activities
Fifth Year	With supervision, student-faculty team is responsible for total program for a group of high school students Some additional course work Continued outside experiences Terminal assessment of achievement and readiness to teach

Post Certification New Faculty team goes to work full-time.

5 years	Every five years thereafter faculty team returns to campus for retooling and work while fifth year teams cover their inservice responsibilities.

NOTE: For an expanded outline of the program see Appendix A.

FOUNDATIONS IN REALITY

First Year

Since high school students have had limited experience with the outside world and have not had the opportunity to look at very many types of work endeavors, probably not even their father's, it is proposed that the first two years of the teacher education program be a personal and exploration period. Upon entering this program the students would be given a battery of psychological and cognitive tests as one basis for deciding on their future work. At this time they would also be assigned to a small group of students and a faculty advisor who would be with them through their entire program.

During the first year of the program a student would not be able to take more than one traditional college course per semester and during the first two years a student would not be permitted to take more than six college credit hours in any one subject area. In this way the student is free to explore many areas of interest without retarding "degree progress." In the first year of the program the student would have an opportunity to work in a tutorial program such as through the YMCA, a girls club or boys club, an evening school, or if you happen to have a progressive high school there might be possibilities there.

During the first year students would divide the twelve months between three different occupations. These occupations

would be of the blue collar type. Perhaps they would work in a hospital, as a gas station attendant, waitress, bar tender, cab driver, store clerk, or truck driver. Work at some combination of three of these types of positions would be required. This would provide the students with an income and result in economic independence. The work would also provide an opportunity to interact with people from various kinds of backgrounds and value systems. Hopefully those students who decide to become teachers would be flexible enough to adapt to these various working cultures and be able to interact and learn the "language" of working people. This is important, since as teachers they will have children of people from all types of work. The principal criterion for the jobs selected would be that the student has to work with other people and that the job be that of a so-called blue collar worker.

Second Year

In the second year of the program the students would shift to working at jobs of the "white-collar" worker level. They would take up to six hours per semester with no more than two of the college courses being in the same subject area. During this time there would be observation of and work with children of various ages. The time would be equally split between more traditional and more innovative schools with 1/3 of the time spent with age groups 3-8, 1/3 with age groups 9-12 and 1/3 with age groups 13-17. During the year the students would have an

opportunity to interact with children of various age levels. During these blocks of time when they are working with various age levels, they would be able to observe and attempt some teaching to small or perhaps even large groups. The minimum requirements would be that they teach at least three "hours" of lessons in a subject area. Of course these experiences would need to be paced to the growth and abilities of each individual student.

The goal of the Foundations in Reality period is for the student to find out to whatever degree he is able, what the world, himself, working, college learning and teaching are about. The goal is not for every student to decide to become a teacher, but to have had some experiences and inputs to give him the basis for making initial career decisions.

DECISION TIME

At the end of the two year Foundations in Reality program the students would have the opportunity to sit down with their faculty-advisor and other people to make initial decisions about their career and further education. During the entire two year experience they have had seminars, probably bi-weekly in the first year and weekly in the second year, in which their reactions to the various kinds of jobs and experiences are shared with fellow students and faculty. Their experiences provide a broad basis upon which they can call in making a tentative career decision. If they do become teachers, their having had some

working knowledge in various areas of employment would be advantageous in working with children who come from these kinds of backgrounds. Due to their having had the Foundations in Reality experience, they would also be in a better position to decide which age group of children they most wish to work with. At this time they would make one of four decisions: 1) further experiences of the kind done during the past two years, 2) to take a full-time position in some occupation, 3) pursue college study in some other area, 4) to further their work in teacher preparation.

For those who decide upon a teacher preparation program, the next three years would be spent in a combination of the following kinds of experiences.

I WANT TO BECOME A SCIENCE TEACHER

During this entire program students must feel free to mature at their own rate. Of course they are going to make mistakes, but the mistakes must be considered from the point of view of growth and not from the point of view of loss or failure. There is a need for natural growth and development, not a contrived growth and development.

At the point the students decide to become teachers the training will become more specialized, with more emphasis on behaviors judged to be important in being a teacher. The students, of course, are going to begin to have less control over their total curricula. During the third year of the program they will

begin to take formal course work in the basic science areas that they plan to teach. This will be done through systematic individualization of instruction and independent study. Probably there will also be traditional college-type lectures, since with motivated students, lectures can be an efficient way of learning. During the third year, the students would work through the entire year with one or more learners on a one-to-one basis. The students would also be working as lab assistants for high school science teachers in preparing materials that the science teachers would be using. One of the more simply corrected, but almost completely overlooked, skills that science teachers of today leave college without having is the ability to prepare equipment for the science laboratory. First-year teachers cannot construct a complete circuit although they can draw you a diagram of an NPN transistor. Students cannot make molar solution but they can draw pictures of sp orbitals. The students would also have an opportunity to study how people learn. This study would ideally be done with children of various age levels and in and out of the classroom so that a better idea of how learning really occurs could be developed. Presently, the bulk of learning goes on outside of a formal classroom situation. Learning goes on at ballgames, learning goes on in interactions with fellow students on campus and in the bull sessions. This learning also seems to be much more fun than in the classroom, otherwise why do students stampede to get out of the classroom when the bell rings?

During the fourth year of the program, the studetns should begin to work with fellow student teachers from other content areas such as a chemistry-oriented person, a physics-oriented person and the mathematics, English and history-oriented students might all get together and work with a faculty team in a school situation. As the year goes along the student-faculty team should become more involved in teaching and planning. In addition to developing skills as individual teachers, they should be developing skills as faculty team members. During this year, the students would also finish most of their college course work as well as take additional electives of their own choosing. In the fifth year the novice faculty team would be responsible for the total program for 30 high school students for the year. This would be carried out with university and inservice faculty team supervision in a regular school setting.

Exit Behaviors

There is only one way to find out whether a student educated in this manner would be a better teacher and that is to do it. In terms of terminal evaluation for the program, of course, there would be achievement tests in the various content areas as well as terminal psychological measures and university faculty judgements about the student's readiness to teach. The ultimate measure of the student's ability to teach would be judged in the fifth year in terms of achievement of the learners that the student-faculty team worked with. It seems conceivable

to me that upon finishing the program the intact faculty team could then be employed by a school system or whatever other form of institution is then responsible for learning. An additional facet of this program would be the requirement that all teachers return to the campus every five years for a year of seminar work to again find out what young people are thinking about and to update their knowledge and training. During that year fifth year student-faculty teams would cover their inservice responsibilities.

III. SOME PROBLEMS FOR THIS OR ANY OTHER PROGRAM

As was mentioned at the outset of this paper, it is becoming increasingly apparent that little change is going to be brought about within the existing institutions, whether they be public schools or college of education. I would like to propose what could be called the Hall Principle: Any independent institutional organization, once it is more than two years old, ceases to be capable of change-even of a relatively minor nature. Accepting the principle then means that probably the easiest way to implement the proposed teacher education program would be to start with a new institution which would contract directly with school systems and with students to prepare them to become teachers. If there were a contract directly with the students, I think that the teacher education program administration then has the responsibility to aid them in locating jobs so that they will not undergo the changes made by most teacher education

graduates today. That is, that inside of two months of taking their jobs, today's beginning teachers are just as "institutionalized" as the people that were there before them.

There is no doubt that one of the things that needs to be accomplished is a radical change in the organizational structure of institutions so that they either have designed-in obsolence as do American automobiles or they are capable of accepting or adapting to radical change as needs dictate. Huntly refers to the self-serving bureaucracy which seems to be one of the few unifying principles of institutuins. Young people are not buying the idea that they are village idiots, and that self-serving bureaucracies are necessary. Five years ago, as one student said, no one would dare question a college or university president, today who could care less about college presidents. The student proposes that the power is being taken away from the central administration and line authorities and is being returned to the hands of the people. He states that hierarchial structures have been shown not to work.

There is an increasing need to look at the structure and function of the administration within organizations. After all, as the same student pointed out, who is weaker than a teacher? Present school administrations are efficient at blocking out time, enforcing silence and limiting students to five minutes to go to the bathroom. However, they do not demonstrate a great deal of willingness to commit themselves to new program ideas or to permit the students within their institutions to gain any sort of responsibility for decision-making within the institution. Today,

administration is looked on as almost being synonymous with legislation rather than being a support function for program.

In order to bring about change it is going to be necessary to have administrators who are interested in people and programs, and who readily realize that they can achieve national fame and prominence as well as material wealth from successful program a lot easier than they can from building empires for controlling budgets, sending out memos about how to use A/V equipment and giving individualized instruction on how to lock your door. We need administrators and teachers who are willing to accept responsibility for their decisions and who are able to make decisions with the realization that they have responsibility for them. In addition, we have to prepare administrators and teachers so that they will accept and value change as a way of life rather than something that is threatening.

CONCLUSION

Our being here and being labelled Young Science Educators indicates that we are interested in change, innovation and doing things differently. Let's hope that ten years from now when we are the Middle-Age Science Educators and twenty years from now when we are the Old Science Educators we are willing to listen to those younger than we who may have ideas contrary to those that we have been developing and that we will give these people the opportunity to try their ideas rather than presenting them with line authority, bureaucratic blocks and discourses on the institutional history of why things are the way they are.

Unless these kinds of changes come about each of us young science educators need not worry about our institution preserving and maintaining itself because the young who are following us will not tolerate it.

Appendix A

HIGHLIGHTS OF REAL WORLD AND PEOPLE TEACHER PREPARATION PROGRAM

Foundations in Reality - This period is for exploration. The student can explore various work areas, various bodies of knowledge in course work, seminar and readings, do some tutoring with peers and young, and learn about himself.

First Year

1. Initial battery of psychological and achievement tests.
2. Assignment to a faculty advisor and seminar group.
3. Split the year between three different "blue collar" worker jobs, e.g. secretary, waitress, bar tender, cab driver or truck driver.
4. No more than one college course per semester. Content area is free but cannot take more than one course in a given area.
5. Weekly meetings with seminar group and faculty advisor.

Second Year

1. Up to two college courses per semester - no more than six hours total in one content area.
2. Work at three different "white collar worker" jobs.
3. Classroom assignment as teacher and tutor, small group teacher. Split the year between three age groups:
   Ages 3-8, 9-12, and 13-17.
   This experience should also be divided between traditional and innovative schools and over various content areas.
4. Bi-weekly seminars and visit with faculty advisor.

Decision time: Do I want to become a teacher:

Review of two year experiences, test results and consultation with advisor and others.
No - go to other tracks.
Yes - make first decisions about 1) age level, 2) content area, 3) type of program.

I want to become a science teacher.

Third Year

1. Course experience in body of knowledge and intellectual skills of science.
2. Work with technical aspects of science (i.e. lab. prep.)

3. Instruction in teaching methods - diagnosing, planning, teaching, assessing and managing.
4. Study of learning from first hand observations and analysis of people learning in both formal and informal settings.
5. Study and practice in analysis and maintaining awareness of people's values.
6. Study and practice in personalizing interactions with others.
7. Study and when reasonable participate in innovative approaches to education, such as learning under hypnosis, CAI, use of drugs, organization of schools and curricula.
8. Involvement in school community.
9. Non-related interest cease work and activity. Teachers need broad perspective and outlet therefore they need secondary involvements, hobbies, etc.
10. Work with one or two individuals and small group for year presenting a portion of their instructors and personal education.

Fourth Year

1. Further work in gaining cognitive and affective skills through course work and independent study.
2. In the first part of the year the emphasis shifts to working with more than one student.
3. As the year progresses, future teachers representing various skills area begin to combine their efforts in presenting the educational experiences for a group of students. They should be working with an inservice team of teachers and university faculty to do this.

Fifth Year

With guidance from the university faculty and the inservice team of teachers the future teacher team presents the total educational program for a group of students.

Graduation

Ideally the total team including parallel trained administrators and supervisors would be brought as a package by an educational system.

Graduation plus five years

Team returns to campus for re-tooling, while fifth-year teams cover their job responsibilities.